

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (currently amended) A bubble cap for use in a reactor in which a gaseous fluid having a vapor density and a liquid fluid having a liquid density flow concurrently downwards in the reactor, the bubble cap comprising:

a cap with at least one slot and a riser, configured with a skirt height of at least 4 cm such that $1.5 * \text{Skirt Height (cm)} + [\text{Slot Length (cm)} - \text{Exposed Slot Height (cm)}] \geq 7.5$, wherein the Exposed Slot Height is determined to equal $44.2 + X^{0.52}$,

wherein X is $Q_v * (W_s * N_s)^{-1} * [\rho_v / (\rho_l \rho_v)]^{0.5}$, wherein Q_v is a vapor volumetric rate flowing through the cap, W_s is mean slot width (cm), N_s is number of slots, ρ_v is the vapor density (kg/m^3), and ρ_l is the liquid density (kg/m^3) and;

wherein the bubble cap is disposed such that [a] the liquid fluid and [a] the gaseous fluid flow co-currently upwardly in a space between the riser and the cap.

2. (Original) The bubble cap of claim 1, wherein $1.5 * \text{Skirt Height (cm)} + [\text{Slot Length (cm)} - \text{Exposed Slot Height (cm)}] \geq 15$.
3. (Original) The bubble cap of claim 1, wherein $1.5 * \text{Skirt Height (cm)} + [\text{Slot Length (cm)} - \text{Exposed Slot Height (cm)}] \geq 22.5$.
4. (Original) The bubble cap of claim 1, wherein $1.5 * \text{Skirt Height (cm)} + [\text{Slot Length (cm)} - \text{Exposed Slot Height (cm)}] \geq 30$.
5. (currently amended) A bubble cap for use in a reactor in which a gaseous fluid having a vapor density and a liquid fluid having a liquid density flow concurrently downwards in the reactor, the bubble cap comprising:

a cap with at least three slots and a riser, configured with a skirt height of at least 4 cm such that $1.5 * \text{Skirt Height (cm)} + [\text{Slot Length (cm)} - \text{Exposed Slot Height (cm)}] \geq 7.5$, wherein the Exposed Slot Height is determined to equal $44.2 + X^{0.52}$,

wherein X is $Q_v * (W_s * N_s)^{-1} * [\rho_v / (\rho_l - \rho_v)]^{0.5}$, wherein Q_v is a vapor volumetric rate flowing through the cap, W_s is mean slot width (cm), N_s is number of slots, ρ_v is the vapor density (kg/m^3), and ρ_l is the liquid density (kg/m^3); and

wherein the bubble cap is disposed such that [a] the liquid fluid and [a] the gaseous fluid flow co-currently upwardly in a space between the riser and the cap.

6. (Original) The bubble cap of claim 5, wherein $1.5 * \text{Skirt Height (cm)} + [\text{Slot Length (cm)} - \text{Exposed Slot Height (cm)}] \geq 15$.
7. (Original) The bubble cap of claim 5, wherein $1.5 * \text{Skirt Height (cm)} + [\text{Slot Length (cm)} - \text{Exposed Slot Height (cm)}] \geq 22.5$.
8. (Original) The bubble cap of Claim 5, wherein $1.5 * \text{Skirt Height (cm)} + [\text{Slot Length (cm)} - \text{Exposed Slot Height (cm)}] \geq 30$.
9. (currently amended) A bubble cap for use in a reactor in which a gaseous fluid having a vapor density and a liquid fluid having a liquid density flow concurrently downwards in the reactor, the bubble cap comprising:
 a cap with at least five slots and a riser, configured with a skirt height of at least 4 cm such that $1.5 * \text{Skirt Height (cm)} + [\text{Slot Length (cm)} - \text{Exposed Slot Height (cm)}] \geq 7.5$, wherein the Exposed Slot Height is determined to equal $44.2 * X^{0.52}$,
wherein X is $Q_v * (W_s * N_s)^{-1} * [\rho_v / (\rho_l - \rho_v)]^{0.5}$, wherein Q_v is a vapor volumetric rate flowing through the cap, W_s is mean slot width (cm), N_s is number of slots, ρ_v is the vapor density (kg/m^3), and ρ_l is the liquid density (kg/m^3) and;
wherein the bubble cap is disposed such that [a] the liquid fluid and [a] the gaseous fluid flow co-currently upwardly in a space between the riser and the cap.
10. (Original) The bubble cap of claim 9, wherein $1.5 * \text{Skirt Height (cm)} + [\text{Slot Length (cm)} - \text{Exposed Slot Height (cm)}] \geq 15$.

11. (Original) The bubble cap of claim 9, wherein $1.5 * \text{Skirt Height (cm)} + [\text{Slot Length (cm)} - \text{Exposed Slot Height (cm)}] \geq 22.5$.
12. (Original) The bubble cap of claim 9, wherein $1.5 * \text{Skirt Height (cm)} + [\text{Slot Length (cm)} - \text{Exposed Slot Height (cm)}] \geq 30$
13. (currently amended) A bubble cap for use in a reactor in which a gaseous fluid having a vapor density and a liquid fluid having a liquid density flow concurrently downwards in the reactor, the bubble cap comprising:

a cap with at least seven slots and a riser, configured with a skirt height of at least 4 cm such that $1.5 * \text{Skirt Height (cm)} + [\text{Slot Length (cm)} - \text{Exposed Slot Height (cm)}] \geq 7.5$, wherein the Exposed Slot Height is determined to equal $44.2 * X^{0.52}$,
wherein $X = Q_v * (W_s * N_s)^{-1} * [\rho_v / (\rho_l - \rho_v)]^{0.5}$, wherein Q_v is a vapor volumetric rate flowing through the cap, W_s is mean slot width (cm), N_s is number of slots, ρ_v is the vapor density (kg/m^3), and ρ_l is the liquid density (kg/m^3) and;

wherein the bubble cap is disposed such that [a] the liquid fluid and [a] the gaseous fluid flow co-currently upwardly in a space between the riser and the cap.
14. (Original) The bubble cap of claim 13, wherein $1.5 * \text{Skirt Height (cm)} + [\text{Slot Length (cm)} - \text{Exposed Slot Height (cm)}] \geq 15$.
15. (Original) The bubble cap of Claim 13, wherein $1.5 * \text{Skirt Height (cm)} + [\text{Slot Length (cm)} - \text{Exposed Slot Height (cm)}] \geq 22.5$.
16. (Original) The bubble cap of Claim 13, wherein $1.5 * \text{Skirt Height (cm)} + [\text{Slot Length (cm)} - \text{Exposed Slot Height (cm)}] \geq 30$.